OKLAHOMA ACADEMIC STANDARDS

SCIENCE
FRAMEWORK
Kindergarten: OVERVIEW

OKLAHOMA STATE DEPARTMENT OF EDUCATION
CHAMPION EXCELLENCE

The Oklahoma State Department of Education is excited to announce the release of the first resources being offered through the Oklahoma Academic Standards Science Frameworks. The Science Frameworks represent curricular resources developed by Oklahoma teachers to help teachers translate standards into classroom practice. The *Framework Overviews* represent how a group of Oklahoma teachers, at a given grade level, might bundle performance expectations/standards found in the Oklahoma Academic Standards for Science.[1] **Bundling** is how teachers would **group performance expectations/standards** for the purpose of developing **instructional units of study.**

Once bundled, the *Science Framework* writers were then charged with completing **four categories of information** that coincided with the bundle of performance expectations/standards. The categories provide insight into how the Science Framework writers collaborated to begin to translate standards into classroom instruction. The guidance provided in the categories does **not** represent a **directive** to teachers, schools or districts for classroom instruction and should not be viewed as such.

The Oklahoma State Department of Education would like to say a special thank you to the Oklahoma educators who participated in developing the Oklahoma Science Framework Overviews and to Quentin Biddy, the project director.

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> "The vision of the Overviews is to provide a resource for teachers that encourages them to embrace the new standards and implement them effectively in their classrooms. The suggestions provided by the frameworks project **do not** have to be implemented exactly as they are written and are **not required** to be a successful teacher, but **serve as a guide** to setting up effective lessons that will help students meet the necessary levels of success in a science classroom." - Oklahoma Science Framework Project Writer

[1] Download the Oklahoma Academic Standards for Science at http://sde.ok.gov/sde/science.

How To Read This Document

Below you will find short descriptions about each of the sections of information provided in this document. If you have questions regarding the *Framework Overviews*, please contact Tiffany Neill at 405-522-3524 or Tiffany.Neill@sde.ok.gov

Science Framework Overview: Sections

In Lay Terms

This section aims at providing a brief introduction to the goals outlined in the Performance Expectation Bundles/grouping of standards.

Three Dimensional Storyline

This section aims at providing a comprehensive instructional storyline of how the three dimensions represented in the Performance Expectation Bundles intertwine to support students engaging in science and engineering practices, crosscutting concepts and disciplinary core ideas. Keep in mind each performance expectation includes one **science and engineering practice**, one **crosscutting concept** and one **disciplinary core idea**. The **color-coding** in this section allows teachers to see where components of these three dimensions appear in the instructional storyline. To find out more about the three dimensions and how they are incorporated into the Oklahoma Academic Standards for Science, review pages 7-8 in the Oklahoma Academic Standards for Science[2] or check out the OKSci PD on Your Plan Module series, Transitioning to the Oklahoma Academic Standards for Science[3].

Lesson Level Performance Expectations

This section aims at providing **scaffolding three-dimensional learning targets** that teachers can design instruction around to meet the end goals of the Performance Expectation(s) represented in the bundles or units of study. Keep in mind the performance expectations represent the things students should know, understand and be able to do to show proficiency at the end of instruction they participate in. A teacher can **utilize** the **Lesson Level Performance Expectations** in each bundle **as a way to develop a series of instruction** to meet the end goals of the performance expectations. For example, a teacher can develop or use a lesson, which may allow students to participate in instruction that covers some of the Lesson Level Performance Expectations, but not all. In this case the teacher would then develop or conduct another lesson that covers other Lesson Level Performance Expectations in the bundle.

Misconceptions

This section aims at providing research-based misconceptions that students frequently have related to the science concepts (disciplinary core ideas) embedded in the Performance Expectation Bundles along with matching correct conceptions.

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[2] Download the Oklahoma Academic Standards for Science at http://sde.ok.gov/sde/science.

[3] Access the OKSci PD on Your Plan Modules at: https://www.evernote.com/l/AUXXlQC11VZDeLmUkOMPpjhKeJjqS-R8gww

Bundle: Pushes and Pulls

K-PS2-1

Students who demonstrate understanding can:

Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object.

K-PS2-2

Students who demonstrate understanding can:

Analyze data to determine if a design solution works as intended to change the speed or direction of an object with a push or a pull.*

In Lay Terms

Pushing and pulling an object will change how it moves. The direction and speed can be affected by the way it is pushed or pulled.

Three Dimensional Storyline

In this performance expectation bundle, students can compare the effects of pushes and pulls on an object's motion, and then determine a way to change the object's speed or direction. In order to compare how pushes and pulls have an effect on motion, students must first observe objects in motion (themselves, doors, fans, swings, etc.) They can record their findings using notes or by drawing pictures. These observations will raise questions such as, "Why do you have to push some objects harder to get them to move? How do you get objects to change the direction that they move?" Through investigations and classroom discussions, students at this grade can begin to formulate explanations for these questions.

From the earliest grades, students should have a variety of opportunities to carry out investigations that will help develop their ability to observe, measure, and analyze data from experiences they have while interacting with the world around them. This can occur through every-day experiences or through intentional small group investigations set up by the teacher. By conducting small group investigations associated with pushes and pulls, students can recognize the cause and effect relationship between the strength of the push of an object and the distance it travels. Through investigation and observation, students will discover that pushes and pulls have different strengths and directions, and that by pushing or pulling on the object, they can change the object's speed or direction. Using the information they observe, students can answer their initial questions and construct explanations for the observations they made.

During their investigations, students may naturally desire to design a structure or tool that will change the direction or speed of a moving object or stop it all together. In either case, students should be prompted to consider how well the design works to change the direction or speed of an

object. Students should be prompted to use data to support their claim for how well the design worked as they intended.

Lesson level Performance Expectations

- Students can observe objects in motion.
- Students can communicate that pushing or pulling on an object can change its speed or direction, or can start or stop it.
- Students can make observations as objects collide.
- Students can communicate from observation that when objects collide, they push on one another and change motion.
- Students can communicate from observation that a bigger push or pull makes things speed up or slow down more quickly.
- Students can plan and carry out a simple investigation to solve a problem.
- Students can determine if something they design to push or pull an object makes it move the way they intended.
- Students can use data to determine how well a design works to change the speed or direction of a moving object.

Misconceptions	Accurate Concept
1. Students may believe passive forces don't exist. 2. Faster moving objects have a larger force acting on them.	1. Inert objects can apply force on objects. Force is also related to how big an object is, not just how fast it is moving.

References

- http://www.physics.montana.edu/physed/misconceptions/forces/description.html#slownoforce

Bundle: Weather

K-ESS2-1

Students who demonstrate understanding can:

Use and share observations of local weather conditions to describe patterns over time.

K-ESS3-2

Students who demonstrate understanding can:

Ask questions to obtain information about the purpose of weather forecasting to prepare for, and respond to, severe weather.

In Lay Terms

By making observations about what the weather is like, patterns in local weather can be observed. Making observations about local weather can lead to questions about weather forecasting and how it helps keep people safe.

Three Dimensional Storyline

Weather is a combination of sunlight, wind, rain, snow, and temperature. Students can observe changes in weather each day and as they experience different seasons.

Through these observations, students should be given opportunities to discuss their observations (sunny, cloudy, rainy, warm or cold) and be prompted to determine if there are patterns in their observations (e.g. Is the weather the same today as it was yesterday? Is the weather the same this month as is was last month?).

While making their observations students may naturally ask questions about why these patterns exist and they may have some ideas about reasons why this is happening. At this age the emphasis is not on a complete explanation for these patterns, but an attempt based on their observations of the patterns.

Observations about weather and weather patterns may also lead students to asking questions about who reports on the weather and why they do that? These questions provide an opportunity to help students gain information about weather forecasting and its ability to help people prepare for severe weather. Students can collect their own weather data in the classroom by keeping weather log books for a period of time. This allows students to track observable patterns.

Lesson Level Performance Expectations

- Students can gather evidence that weather is a combination of sunlight, wind, snow or rain, and temperature in a certain place.
- Students can construct explanations that describe changes in the weather they observe.
- Students can make observations about weather and describe patterns associated with weather over time.
- Students can raise questions from observations about severe weather and how weather scientists forecast severe weather so that they can protect communities.
- Students can communicate using evidence that certain kinds of severe weather are more likely than others in a given region.
- Students can communicate that we use technology to help with weather forecasting.
- Students can communicate that we use technology to alert people to serve weather.

Misconceptions	Accurate Concept
1. Clouds and rain are independent.	1. Clouds are necessary but not sufficient predictors of rain. The presence of clouds does not mean it will rain.

References

- http://www.csulb.edu/~lhenriqu/NARST2000.htm

Bundle: Sunlight

K-PS3-1

Students who demonstrate understanding can:

Make observations to determine the effect of sunlight on Earth's surface.

K-PS3-2

Students who demonstrate understanding can:

Use tools and materials to design and build a structure that will reduce the warming effect of sunlight on an area.*

In Lay Terms

Through observations, students can see examples of sunlight heating different surfaces on Earth. Students then have opportunities to see how different materials can block the sun and reduce the warming of different surfaces.

Three Dimensional Storyline

In this performance expectation bundle, students are able to make observations of the sunlight's impact on different surfaces on Earth and then think about materials for designing a structure that would reduce this impact. In making observations, students can begin to explain phenomena like, "Why the ground is cooler in the shade than in the sun?"

In order for students to make a claim that sunlight warms the surface of the Earth, students must first be given opportunities to observe sunlight or a variety of surfaces (sidewalk, grass, T-shirts, playground toys). Students can then begin to identify patterns that might suggest a cause and effect relationship between the light and the temperature of the surface of objects. At this age, the crosscutting concept of cause and effect has students examining and analyzing patterns found in everyday life, and beginning to consider what might be causing these patterns. In order to do this students should be given experiences through simple investigations that allow them to gather evidence to support or refute their ideas about causes and ultimately lead them to identifying the pattern, "sunlight warms the earth's surfaces."

With an understanding that sunlight warms the Earth's surfaces, students can be given an opportunity to think about materials or structures, like umbrellas, that might reduce this warming effect. Students should be thinking about and/or discussing why they think a certain material or structure reduces the warming effect (i.e. It blocks the sun).

Lesson Level Performance Expectations

- Students can make observations to determine the effect of sunlight on Earth's surface.

- Students can make observations of the sunlight's impact on surfaces on Earth.
- Students can observe patterns for how the sunlight impacts surfaces on Earth.
- Students can communicate from observations that sunlight warms surfaces on Earth.
- Students can design a structure that will reduce the warming effect of sunlight on a surface.
- Students can use tools and materials to build a structure that will reduce the warming effect of sunlight on an area.*

Misconceptions	Accurate Concept
1. The sun disappears at night.	1. The Earth is a sphere and rotates, as a result the sun only shines on one half of the Earth at any given time.
2. Snow and ice make it cold outside.	2. Decreased amounts of sunlight result in colder temperatures, snow and ice are a result of colc temperatures, not the cause.
3. Sunlight is helpful but not critical.	3. Sunlight is essential for plant survival and the source of nearly all the energy on our planet.

References

- http://k12s.phast.umass.edu/~nasa/misconceptions.html
- http://beyondpenguins.ehe.osu.edu/issue/weather-and-climate-from-home-to-the-poles/common-misconceptions-about-polar-weather-and-climate
- http://beyondpenguins.ehe.osu.edu/issue/polar-plants/common-misconceptions-about-plants

Bundle: Plant and Animal Behavior

K-LS1-1

Students who demonstrate understanding can:

Use observations to describe patterns of what plants and animals (including humans) need to survive.

K-ESS2-2

Students who demonstrate understanding can:

Construct an argument supported by evidence for how plants and animals (including humans) can change the environment to meet their needs.

K-ESS3-1

Students who demonstrate understanding can:

Use a model to represent the relationship between the needs of different plants or animals (including humans) and the places they live.

In Lay Terms

Living things (plants, animals, and humans) help each other survive. Plants rely on animals and humans to spread seeds so more plants can be produced; animals need plants for nutrients to grow; and all living things need water, air, and sunlight to survive. They get these things from the places they live and in some cases they can change the places they live to meet their needs.

Three Dimensional Storyline

Animals (including humans) and plants are everywhere around us and students at this age should be given ample opportunities to observe plants and animals in their natural environments. These observation can lead students to ask questions like, "Why do some animals live in the ground and some live on plants? Why do plants die if we don't water them? How do seeds move from where a plant is located to different spots in the ground? Why does the dirt where a plant is look different than the dirt where a plant isn't located? Why are there holes in the dirt in my backyard or playground?"

When students ask questions, they can begin to utilize other observations to begin to formulate explanations. For example, students can observe that plants seem to grow where they have access to sunlight and water or animals live where they have access to water and food. Students can observe interactions among plants and animals like animals eating plants.

Students can observe impacts that humans have on the environments that plants and animals live in. For example, humans may build homes in

places where animals live or plants grow or humans may eat plants and animals.

Using systems and system models students can better understand the relationship between plants and animals and the environments in which they live in. At this age, students can be prompted to think about the systems they may be examining (playground, pond, aquarium) and all the parts in that system. Students can then begin to develop and use models to think about how the parts work together in that system. This line of thinking can assist students as they think about the interactions between plants and animals (including humans). Students can then draw sketches or use manipulatives to represent plants and animals in a system and how they interact to begin to answer questions they may have developed from their observations of plants and animals in their natural environments.

Lesson Level Performance Expectations

- Students can make observations of plants and animals in their environments.
- Students can communicate that animals need food to live and grow.
- Students can communicate that animals get their food from plants or other animals.
- Students can communicate that plants need water and light to live and grow.
- Students can develop a model to show that living things need water, air, and things from the land; and they live where these items they need are.
- Students can raise questions about plants and animals changing their environment.
- Students can use observational data to make claims that things people do to live can affect the world around them.

Misconceptions

1. Sunlight is helpful but not critical.
2. Sunlight helps plants grow by keeping them warm.
3. Soil provides a support structure and food for plants.
4. Plants need things provided by people (water, nutrients, light)

Accurate Concept

1. Sunlight is essential for plant survival.
2. Plants use sunlight to make food.
3. Some plants grow in soil-free environments. Plants take up water and minerals from soil, but not "food."
4. While people often care for plants (especially those indoors), plants as a whole are not dependent on people for their needs.

References

- http://beyondpenguins.ehe.osu.edu/issue/polar-plants/common-misconceptions-about-plants

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